

Claims

- [c1] 1.A connecting fastener, comprising:
- a cylindrical base having a central bore disposed therein, including a first end and a second end and a base wall, said base wall having a partial gap disposed therein;
 - at least one projection, extending from an inner surface of the wall into the central bore proximate the first end of the base;
 - a cylindrical collar having a central bore disposed therein and a first end disposed proximate the second end of the base, and a collar wall, said collar wall having a gap; and
 - a shoulder connected to and extending between the second end of the base and the first end of the collar along at least a portion of a respective circumferences of the base and the collar.
- [c2] 2.The fastener of claim 1, wherein the at least one projection extending from said inner surface of the wall of the base includes two inwardly extending projections.
- [c3] 3.The fastener of claim 2, wherein the projections are opposed about a diameter of the bore of the base.

- [c4] 4.The fastener of claim 1, wherein the at least one projection extends along a portion of an inner circumference of the base.
- [c5] 5.The fastener of claim 1, wherein the at least one projection includes at least one of a ramp surface, a stopping wall, a retaining wall and a locking surface.
- [c6] 6.The fastener of claim 1, wherein the aperture defined in the wall of the base is of a sufficient width to allow a sealing surface on a tube to pass through the aperture.
- [c7] 7.The fastener of claim 6, wherein the aperture is defined in the wall of the base at the second end of the base and extends toward the first end of the base.
- [c8] 8.The fastener of claim 1, wherein the wall of the base further comprises ribs on its outer surface.
- [c9] 9.The fastener of claim 1, wherein an outer diameter of the collar is less than an outer diameter of the base.
- [c10] 10.The fastener of claim 1, wherein an outer diameter of the collar is less than an inner diameter of the base.
- [c11] 11.The fastener of claim 1, wherein the gap defined in the wall of the collar extends parallel to a longitudinal axis of the collar from the first end of the collar to the

second end of the collar and is of a width sufficient to allow a tube to be inserted through the gap with the application of force.

[c12] 12. The fastener of claim 1, further comprising a pair of opposing wings projecting from the outer surface of the collar and extending parallel to the longitudinal axis of the collar between the first and second ends of the collar.

[c13] 13. A connecting fastener, comprising:
a hollow cylindrical body, which includes:
a base that includes a first end and a second end,
and defines a first central bore;
at least one projection, extending from an inner surface of the base into the first central bore proximate the first end of the base;
a cylindrical collar that includes a first end disposed proximate the second end of the base and defines a second central bore; and
a shoulder connected to and extending between the second end of the base and the first end of the collar along at least a portion of the circumferences of the base and the collar; and
an aperture defined in the cylindrical body, extending about a portion of the body from an area near the first end of the base and through the collar, wherein

the width of the aperture at the base of the body is greater than the width of the aperture at the collar.

- [c14] 14.The fastener of claim 13, wherein the outer diameter of the collar is less than the outer diameter of the base.
- [c15] 15.The fastener of claim 13, wherein the at least one projection extending from an inner surface of the base includes at least two projections.
- [c16] 16.The fastener of claim 15, wherein the at least two projections are opposed about the diameter of the bore of the base.
- [c17] 17.The fastener of claim 13, wherein the at least one projection includes at least one of a ramp surface, a stopping wall, a retaining wall and a locking surface.
- [c18] 18.The fastener of claim 13, wherein the width of the aperture defined in the cylindrical body at the base is sufficient to allow a sealing surface on a tube to pass through, and at the collar is narrower than the width of the tube.
- [c19] 19.The fastener of claim 13, further comprising a pair of opposing wings, wherein each wing projects from the outer surface of the collar and extends parallel to the longitudinal axis of the collar along the length of the

collar.

[c20] 20.A fastening connection, comprising:

(a)a connector member, including:

(i)a cylindrical base that includes a first end, a second end and a wall, and defines an aperture in the wall and a central bore;

(ii)at least two uniformly spaced projections, extending from an inner surface of the wall into the central bore proximate the first end of the base;

(iii)a cylindrical collar that includes a wall and a first end disposed proximate the second end of the base, defines a central bore and defines a gap in the wall; and

(iv)a shoulder connected to and extending between the second end of the base and the first end of the collar along at least a portion of the respective circumferences of the base and the collar; and

(b)a receiving member, including:

(i)a cylindrical body that includes a first end, a second end and an outer diameter that is less than the distance between the at least two uniformly spaced projections on the base of the connector member across the central bore of the connector member;

and

(ii) means to secure at least a portion of the body of the receiving member to the connector member.

[c21] 21. The fastening connection of claim 20, wherein the means to secure at least a portion of the body of the receiving member to the connector member include at least two opposing tabs projecting from the outer surface of the cylindrical body near the first end of the body.

[c22] 22. The fastening connection of claim 21, wherein there are two uniformly spaced projections on the receiving member and each projection includes a locking surface that engages a corresponding tab of said receiving member.

[c23] 23. The fastening connection of claim 22, wherein the securing of the receiving member to the connector member is effectuated with a turn of the connector member that is approximately one-quarter of the circumference of the outer circumference of the base of the connector member.

[c24] 24. The fastening connection of claim 20, wherein the outer diameter of the wall of the collar is less than the outer diameter of the wall of the base.

- [c25] 25.The fastening connection of claim 20, wherein the projections are opposed about the central bore of the cylindrical base.
- [c26] 26.The fastening connection of claim 20, wherein the width of the aperture in the wall of the cylindrical base is sufficient to allow a sealing surface on a tube to pass through the aperture.
- [c27] 27.The fastening connection of claim 26, wherein the aperture is defined in the wall of the base at the second end of the base and extends toward the first end of the base.
- [c28] 28.The fastening connection of claim 20, wherein the gap in the wall of the cylindrical collar extends parallel to the longitudinal axis of the collar along the length of the collar and is of a width sufficient to allow a corresponding tube to be inserted through the gap with an application of force.
- [c29] 29.The fastening connection of claim 20, further comprising a pair of opposing wings projecting from the outer surface of the collar and extending parallel to the longitudinal axis of the collar along the length of the collar.

[c30] 30.A fastened tubing connection, comprising:

(a) a tube, including:

(i) a shaft with an operational end; and

(ii) a sealing surface on the shaft proximate the operational end, wherein the sealing surface includes a shoulder;

(b) a connector member, including:

(i) a cylindrical base that includes a first end, a second end and a wall, and defines an aperture in the wall and a first central bore;

(ii) at least two uniformly spaced projections, extending from an inner surface of the wall into the first central bore proximate the first end of the base;

(iii) a cylindrical collar that includes a first end disposed proximate the second end of the base and a wall with an outer diameter that is less than the outer diameter of the wall of the cylindrical base, wherein the wall defines a gap and the collar defines a second central bore; and

(iv) a shoulder connected to and extending between the second end of the base and the first end of the collar along at least a portion of the respective cir-

cumferences of the base and the collar;

(c)a receiving member, including:

(i)a cylindrical body that includes a first end, a second end and an outer diameter that is less than the distance between the at least two uniformly spaced projections on the base of the connector member across the diameter of the first central bore, and defines a third central bore; and

(ii)means to engage at least a portion of the body of the receiving member in the first central bore; and

(d)whereby the sealing surface of the tube passes through the aperture in the base of the connector member into the first central bore and the shaft of the tube below the bevel passes through the gap in the collar to the second central bore, allowing the shoulder of the sealing surface to contact an end surface of the collar at the first end of the collar of the connector member, and the receiving member secures the shoulder and end surface in contact with one another by receiving the operational end of the shaft in the third central bore and contacting the taper of the bevel while the means to engage the receiving member in the first central bore are engaged.

- [c31] 31.The connection of claim 30, wherein the means to engage at least a portion of the body of the receiving member in the first central bore include at least two opposing tabs projecting from the outer surface of the cylindrical body proximate the first end of the body.
- [c32] 32.The connection of claim 31, wherein there are two uniformly spaced projections on the receiving member and each projection includes a locking surface, and wherein each of the two tabs contacts a respective locking surface to effectuate the engagement of the receiving member in the connector member.
- [c33] 33.The connection of claim 32, wherein the engagement of the receiving member in the first central bore of the connector member is effectuated with a turn of the connector member that is approximately one-quarter of the circumference of the outer surface of the receiving member.
- [c34] 34.The connection of claim 30, wherein the bevel on the shaft defines a channel about its circumference and includes a supplemented sealing means disposed in said sealing means.
- [c35] 35.The connection of claim 34 wherein said supplemental sealing means is a gasket.

[c36] 36.The connection of claim 35 wherein said gasket is an o-ring.

[c37] 37.The connection of claim 30, wherein the projections are opposed about the first central bore.

[c38] 38.The connection of claim 30, further comprising a pair of opposing wings projecting from the outer surface of the collar and extending parallel to the longitudinal axis of the collar along the length of the collar.

[c39] 39.A method of connecting tubing, comprising:
 (a)providing a tube including an operational end and a sealing surface adjacent the operational end, wherein the sealing surface includes a shoulder;
 (b)providing a connector member, including:
 (i)a cylindrical base that includes a first end, a second end and a wall, and defines an aperture in the wall and a first central bore;
 (ii)at least two uniformly spaced projections, extending from an inner surface of the wall into the first central bore proximate the first end of the base;
 (iii)a cylindrical collar that includes a first end disposed proximate the second end of the base and a

wall with an outer diameter that is less than the outer diameter of the cylindrical base, and defines a gap in the wall and a second central bore; and
(iv) a shoulder connected to and extending between the second end of the base and the first end of the collar along at least a portion of the respective circumferences of the base and the collar;

(c) providing a receiving member, including:

(i) a cylindrical body that includes a first end, a second end and an outer diameter that is less than the distance between the at least two uniformly spaced projections on the base of the connector member across the first central bore, and defines a third central bore; and

(ii) means to engage at least a portion of the body of the receiving member in the first central bore;

(d) inserting the operational end of the shaft of the tube through the aperture defined in the wall of the cylindrical base, and past the first end of the base;

(e) passing the sealing surface through the aperture and into the first central bore;

(f) pressing the portion of the shaft of the tube below the bevel through the gap defined in the collar and into the second central bore;

(g)moving the connector member along the tube toward the operational end of the tube until the shoulder of the sealing surface and an end surface of the collar of the receiving member are in contact with one another;

(h)inserting the operational end of the shaft into the third central bore until the first end of the receiving member contacts the sealing surface of the tube, whereby the first end of the receiving member enters the first central bore; and

(i)turning the connector member to secure the receiving member to the connector member.

[c40] 40.The method of claim 39, wherein the step of turning the connector member includes turning the connector member about one quarter of the distance of the circumference of the outer surface of the base of the connector member.

[c41] 41.The method of claim 39, wherein the means to engage the body of the receiving member in the first central bore includes two opposing tabs, and there are two projections on the base of the connector member, and wherein the step of turning the connector member includes engaging the tabs of the body of the receiving member with the projections of the connector member.

- [c42] 42.The method of claim 41, wherein each projection includes a locking surface and the tabs engage the respective locking surface of each corresponding projection.
- [c43] 43.The method of claim 39, wherein the step of inserting the shaft of the tube through the gap in the collar includes the use of force to cause the tube to pass through the gap.
- [c44] 44.The method of claim 39, wherein the receiving member includes two opposing wings on the collar and the step of turning the connector member includes pressing on at least one of the wings.
- [c45] 45.A tubing connection made according to the process of claim 39.